

REMARKS

In the final Office Action mailed June 16, 2004, the Examiner noted that claims 1-57 were pending, that claims 10-14, 24-48 and 52-57 have been withdrawn from consideration, that claims 1-9, 15-23, and 49-51 were available for reconsideration, and rejected claims 1-9, 15-23, and 49-51. Claims 1, 2, 5, 6, 15, 16 and 49 have been amended, new claims 58-68 have been added and, thus, in view of the forgoing claims 1-9, 15-23, 49-51 and 58-68 remain pending for reconsideration which is requested. No new matter has been added. The Examiner's rejections are traversed below.

Claims 1-3, 5-9, 15, 18 and 49-51

On page 3 of the Office Action, the Examiner rejected claims 1-3, 5-9, 15, 18 and 49-51 under 35 U.S.C. § 102 as anticipated by Vuylsteke. Page 6 of the Office Action rejects claims 4, 16, 17 and 19-23 under 35 U.S.C. § 103 over Vuylsteke.

An interview with the Examiner was conducted where the teachings of Vuylsteke and the invention were discussed. In the interview it was pointed out to the Examiner that in Vuylsteke the residual image 31' is a low spatial resolution image (see col. 7, lines 37-42), that the detail image 31 is an original or higher spatial resolution image (see col. 7, lines 43-46) and that it is the detail image 31 or original/higher spatial resolution image that is filtered - attenuated (see col. 7, lines 18-20). It was also pointed out that, in contrast, in the present invention it is the low spatial resolution (base digital image) that is filtered as emphasized in the claims, for example claim 1. It was also noted that the multi-resolution processing of the invention could be analogized to as an iterative unsharp masking operation with a pixel-sampling step thrown in before the next iteration. When viewed in this way looking at what is filtered from a spatial resolution perspective delineates the difference between Vuylsteke and the invention. In short Vuylsteke modifies the "sharp" part while the invention modifies the "unsharp" part.

Vuylsteke is an iterative process. In this iterative process an original image 2 (see figure 4a) is decomposed into a series of detail images 31 and a single "residual" image 31'. In a first iterative cycle, the original image 2 is filtered by a low pass filter 41 and subsampled producing a low pass filtered and lower spatial resolution image g1. The low pass filtered and lower resolution image g1 is modified by interpolator 42 and adder 43 to return the spatial resolution to the resolution of the original image producing a low pass filtered detail image 31 (b1) having the same resolution as the original image. That is, in the first iteration a low pass filtered image 31 of the same resolution as the original image is produced as well as a low pass filtered lower resolution image g1. In the last iteration (see figure 4a), the low pass filtered lower resolution

image gL-2 is named the residual image 31'. For the second iteration, the low pass filtered and lower spatial resolution image g1 is again low pass filtered using filter 41' and again subsampled producing a further low pass filtered and further lower spatial resolution image g2 which is modified by interpolator 42' and adder 43' to produce further low pass filtered detail image 31 (b2) having the same resolution as the g1 image. That is, at the first and each intermediate stage the image gn is filtered and sampled except for the last stage where the lowest resolution image 31' (gL) is left unfiltered. In other words, the lowest resolution image 31' produced by Vuylsteke, that is, the residual image 31' is left unfiltered.

Because Vuylsteke does not filter noise from the lowest resolution residual image 31', when an image is reconstructed from the series of images 31' and 31, noise is present in the reconstructed image.

The present invention also produces a series of images, a pyramid, of lower resolution images. However, in contrast to Vuylsteke, the present invention filters the lowest resolution or base digital image. As a result, as particularly emphasized in the claims (see claims 1 and 49), when a reconstructed image is produced the reconstructed image has "reduced noise" as compared to the original image.

Vuylsteke does not produce such a reduced noise reconstructed digital image. That is, Vuylsteke produces a reconstructed image that includes the original noise while the present invention produces an image that has reduced noise. As a result, the present invention provides a better reconstructed image than Vuylsteke.

It is submitted that the invention of independent claims 1 and 49 distinguish over the prior art and withdrawal of the rejection is requested.

The dependent claims depend from the above-discussed independent claims and are patentable over the prior art for the reasons discussed above. The dependent claims also recite additional features not taught or suggested by the prior art. For example, claim 5 calls for "removing noise from the reconstructed digital image by using the noise reduction filter". The Examiner points to col. 8, lines 4-12 of Vuylsteke alleging that this portion of Vuylsteke teaches this feature. The portion of Vuylsteke noted by the Examiner is discussing the filters used in the deconstruction operation. The discussion of the reconstruction operation is discussed starting at col. 8, line 13. Vuylsteke does not teach or suggest filtering the reconstructed image. The other dependent claims also include patentably distinguishing features. It is submitted that the dependent claims are independently patentable over the prior art.

New Claims 58-68

New claims 58-68 have been added. New claims 58 and 59 are directed to filtering during the pyramid construction and also emphasizes removing noise from the final base digital image. This is something that is not taught or suggested by Vuylsteke. New claim 60 emphasizes filtering after the pyramid construction and particularly noise cleaning the lowest resolution base image. Once again this is something that is not taught or suggested by Vuylsteke. New claim 61 emphasizes filtering after the pyramid construction where the noise cleaning is without modifying the residual. Vuylsteke does not teach or suggest such. New claim 62 emphasizes filtering after the pyramid construction where each of the base images, including the final base image, is noise cleaned. Vuylsteke also does not teach or suggest this. New claim 63 also emphasizes filtering the lowest resolution image. Again something that Vuylsteke does not do. New claim 64 emphasizes noise filtering the base digital image after decomposing the image into a set of residual images and the base image. Vuylsteke also does not teach or suggest this. New claim 65 emphasizes filtering during image reconstruction, not deconstruction. Again something that Vuylsteke does not do. New claim 66 emphasizes that the last operation in an iteration is to filter to generate a lower resolution base image, something that the prior art of Vuylsteke does not do. New claim 67 emphasizes generating a residual from a noise reduced base image. Vuylsteke also does not teach or suggest this. New claim 68 emphasizes creating a set of images where the final image in an iteration is filtered. Again something that Vuylsteke does not do this.

Nothing in the prior art teaches or suggests the new claims. It is submitted that these new claims, which are different and not narrower than prior filed claims, distinguish over the prior art.

It is submitted that the claims are not taught, disclosed or suggested by the prior art. The claims are therefore in a condition suitable for allowance. An early Notice of Allowance is requested.

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If any further fees, other than and except for the issue fee, are necessary with respect to this paper, the U.S.P.T.O. is requested to obtain the same from deposit account number 19-3935.

Respectfully submitted,

STAAS & HALSEY LLP

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